

CLAIMS

1. A power amplifier module comprising:
an RF power amplifier circuit (201) having a power supply regulated
5 output power level;
a power supply transistor (207) coupled to the power amplifier circuit
(201) and operable to control a power supply to the power amplifier circuit
(201) in response to a drive signal;
a drive circuit (209) coupled to the power supply transistor (207) and
10 operable to generate the drive signal in response to a power level input signal;
characterized by further comprising:
operating characteristic responsive means (211) responsive to a voltage
across the power supply transistor (207) related to saturation of the power
supply transistor (207); and
15 a control circuit (213) coupled to the drive circuit (209) and operable to
control the drive signal in response to the voltage across the power supply
transistor (207).
- 20 2. A power amplifier module as claimed in any previous claim wherein the
voltage across the power supply transistor (207) is related to an operating gain
characteristic of the power supply transistor (207).
3. A power amplifier module as claimed in any previous claim wherein the
25 control circuit (213) comprises a negative feedback loop from the operating
characteristic responsive means (211) to the drive circuit (209).
4. A power amplifier module as claimed in any previous claim wherein the
power supply transistor (207) is a Field Effect Transistor (FET).

5. A power amplifier module as claimed in claim 4 wherein the control circuit (213) is operable to control the drive signal to substantially prevent the power supply transistor (207) from entering a FET linear region operating state.

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6. A power amplifier module as claimed in any previous claim wherein the operating characteristic responsive means (211) comprises a sense transistor (329) operable to detect a drain-gate voltage of the power supply transistor (207).

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7. A power amplifier module as claimed in claim 6 wherein the sense transistor (329) is operable to conduct a current if the power supply transistor (207) enters a FET linear region of operation and the control circuit (213) is operable to control the drive signal in response to the current.

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8. A power amplifier module as claimed in claim 7 wherein the sense transistor (329) conducts current if a drain-source voltage of the power supply transistor (207) is below a gate-source voltage minus a threshold voltage of the power supply transistor (207).

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9. A power amplifier module as claimed in claim 7 or 8 wherein the control circuit (213) is operable to reduce an absolute amplitude of the drive signal in response to the sense transistor (329) conducting the current.

25 10. A power amplifier module as claimed in any of claims 7 to 9 wherein a gate of the sense transistor (329) is connected to a gate of the power supply transistor (207) and a source of the sense transistor (329) is connected to a drain of the power supply transistor (207).

11. A power amplifier module as claimed in any of claims 6 to 10 wherein the sense transistor (329) has a threshold voltage similar to the threshold voltage of the power supply transistor (207).
- 5 12. A power amplifier module as claimed in any of claims 6 to 11 wherein the control circuit (213) comprises an output transistor (331) coupled to the sense transistor (329) and to a signal junction in the drive circuit (209) such that if the sense transistor (329) conducts current, the output transistor (331) becomes active and causes a signal level at the signal point to be reduced.
- 10 13. A power amplifier module as claimed in claim 12 wherein the sense transistor (329) is connected to a first input of a current image circuit (333, 335) and the output transistor (331) is connected to a second input of the current image circuit (333, 335).
- 15 14. A power amplifier module as claimed in any previous claim wherein a supply voltage for the power supply transistor (207) is a variable voltage.
- 20 15. A power amplifier module as claimed in any previous claim wherein the power supply transistor (207) is a bipolar transistor
- 25 16. A power amplifier module as claimed in claim 15 wherein the control circuit (213) is operable to control the drive signal to substantially prevent the power supply transistor (207) from entering a bipolar transistor saturated region.
- 30 17. A power amplifier module as claimed in claim 15 or 16 wherein the means for determining (211) comprises a bipolar sense transistor operable to detect a collector-base voltage of the power supply transistor (207).
18. A Time Division Multiple Access radio comprising:

means for generating a power ramp signal;

a power amplifier circuit (201) having a power supply regulated output power level;

a power supply transistor (207) coupled to the power amplifier circuit
5 (201) and operable to control a power supply to the power amplifier circuit (201) in response to a drive signal;

a drive circuit (209) coupled to the power supply transistor (207) and operable to generate the drive signal in response to the power ramp signal; characterized by further comprising:

10 operating characteristic responsive means (211) responsive to a voltage across the power supply transistor (207) related to saturation of the power supply transistor (207); and

a control circuit (213) coupled to the drive circuit (209) and operable to control the drive signal in response to the voltage across the power supply
15 transistor (207).